

The specification has also been amended at page 10, line 23 to include the reference numeral 25b in reference to the branched core.

Claim Rejections – 35 U.S.C. § 103

In Office Action paragraph 2, claims 1-4, and 6-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kobayashi et al. "Fluorinated Polyimide Waveguides with Low Polarization-Dependent Loss and their Applications to Thermo-optic Switches" in view of Yamashita et al., JP 59-33430. In Office Action paragraph 3, claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Kobayashi et al. in view of Yamashita et al., and further in view of Cohen et al., U.S. Patent No. 5,418,868. In Office Action paragraph 4, claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Kobayashi et al. in view of Yamashita et al., and further in view of Ooba et al., "Low crosstalk and low loss 1x8 digital optical switch using silicone resin waveguides".

There is no teaching, motivation, or suggestion to combine Kobayashi et al. with Yamashita et al.

Applicants respectfully submit that there is no teaching, motivation, or suggestion to combine Kobayashi et al. with Yamashita et al. It is well known that there must be a teaching, motivation, or suggestion to combine prior art references to render a claimed invention obvious. *In re Lee*, 61 U.S.P.Q. 2d 1430 (Fed. Cir. 2002). Further, the teaching, motivation, or suggestion to combine the prior art references must be identified with specificity. *In re Lee*, at 1433.

The thermo-optic switch of Kobayashi et al. and the optical switch of Yamashita et al. are significantly different from each other. The thermo-optic switch of Kobayashi et al. has an optical path which decreases its refractive index to block light when heated. Conversely, the optical switch of Yamashita et al. has an optical path which increases its refractive index when heated. An English translation pertaining to the description of the heaters 6, 7, 8 of Yamashita et al. is enclosed. In Kobayashi et al., when electric power is applied to heater 1, the refractive index of port 1 decreases and the optical power is directed to port 2. Similarly, when the electric power is applied to heater 2 of Kobayashi et al., the refractive index of port 2 decreases and the optical power switches to port 1. The operation of the Yamashita et al. optical switch is completely different from the operation of the Kobayashi et al. thermo-optic switch. In

Yamashita et al., heaters 6 and 7 heat the optical path to increase the refractive index of the optical path 3, 4 so that light travels through the branching section 4. Heaters 6 and 8 are activated to apply heat to the optical path 3, 5 to increase the refractive index of the optical path so that light travels through branching section 5. Accordingly, Kobayashi et al. and Yamashita et al. use very different techniques to switch the path of the light, and neither reference provides a teaching, motivation, or suggestion to combine the different optical switching techniques.

Furthermore, the heaters in Kobayashi et al. and Yamashita et al. are significantly different from each other. Kobayashi et al. shows two heaters, heater 1 for port 1 and heater 2 for port 2. The Kobayashi et al. heater structure is similar to the optical switch and heater structure discussed in the Background Art section of the present specification (pages 1-4, Figs. 7A and 7B). Such optical switches have exhibited problems with heating the optical path to reduce the refractive index of the optical path. See the specification of the present application at page 3, line 17-page 4, line 8. Conversely, Yamashita et al. increases the refractive index by heating the optical path, and thus, does not exhibit the same problems as the thermooptic switch of Kobayashi et al. Apparently, Yamashita et al. addresses problems associated with increasing the refractive index by heating the optical path. Since Kobayashi et al. and Yamashita et al. address different problems with different types of optical switches, there is no teaching, motivation, or suggestion to combine the references.

The structures and locations of the heaters in Kobayashi et al. and Yamashita et al. do not provide a basis for combining the references. The thermooptic switch of Kobayashi et al. has a single heater 1 for heating a portion of the branching area in port 1, and a second heater 2 for heating an opposite portion of the branching area and port 2. The heaters 1 and 2 do not entirely overlay their respective portions of the optical paths. Conversely, the optical switch of Yamashita et al. includes three heaters 6, 7, and 8. Heaters 6 and 7 apply heat to direct light through their branched optical path 4 and heaters 6 and 8 apply heat to direct light through their branched optical path 5. Furthermore, the Yamashita et al. heaters 6, 7, and 8 completely overlay their respective optical paths. Applicants respectfully submit that the references do not provide a teaching, motivation, or suggestion to replace the single heater 1 of Kobayashi et al. which does not completely overlay its optical path with the two separate heaters 6 and 7 of Yamashita et al. which directly overlay their optical path. Similarly, there is no teaching,

motivation, or suggestion to replace the heater 2 of Kobayashi et al. with heaters 6 and 8 of Yamashita et al.

Thus, Applicants respectfully submit that Kobayashi et al. and Yamashita et al. are not properly combinable and the §103 rejections are improper for this reason alone.

The combination of Kobayashi et al. and Yamashita et al. does not result in Applicants' claimed invention.

Even if Kobayashi et al. and Yamashita et al. are combined, the combination does not result in Applicants' claimed invention. Claim 1 has been amended to call for "each branched core heater having distances from the branched core and a portion of the branching section facing the branched core so as not to disturb a light-branching operation." Referring to the example of Applicants' claimed invention shown in Fig. 1, the branched core heater 12 has a distance L3 from the branched core 5b. The branched core heater 12 also has a distance from a portion of the branching section 4b facing the branched core 5b. The branched core heater 12 has the distances from the branched core 5b and the portion of the branching section 4b facing the branched core 5b so as not to disturb a light-branching operation. The branched core heater 12 does not disturb the light-branching operation of the branching section heater 11 which branches the light to the branch core 5b. Similar comments apply to the branched core heater 14 and the branching section heater 13 in the example of the invention shown in Fig. 1.

As mentioned, Kobayashi et al. includes two heaters, heater 1 and heater 2 for decreasing the refractive index of the optical paths. Yamashita et al. includes three heaters 6, 7, and 8 for increasing the refractive index of the optical paths. In Yamashita et al., a light-branching operation of the optical switch requires a combination of heaters 6 and 7 or a combination of heaters 6 and 8. The light-branching operation is impossible if only heater 6 operates. Again, the heaters 6, 7, 8 of Yamashita et al. significantly overlay the optical paths. Thus, in Yamashita et al., either one of heaters 7 or 8 has an important aspect of the light-branching function in the optical switch.

Conversely, in the present invention, the light-branching operation is performed by heaters 11 and 13 disposed in a branching section 4b. This feature of the present invention distinguishes Yamashita et al. which must use all three heater 6, 7, and 8 so as to obtain the same light-branching function as that of the present invention. Also, in the present invention, heaters

12 and 14 which are disposed at branched cores 5a and 5b provide optical attenuation so as to attenuate light in the branching section 4b having insufficient extinction rate. Thus, the heaters 12 and 14 in the present invention do not perform the light-branching function.

Therefore, Applicants respectfully submit that even if Kobayashi et al. and Yamashita et al. are combined, the combination does not result in Applicants' claimed invention.

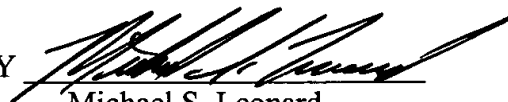
Thus, Applicants respectfully submit that the §103 rejections have been overcome.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made."

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Please amend the specification at page 10, lines 20-26 to read as follows:

The Y-shaped core 24 in this example is comprised by an input-side linear section 24a extending from the light input side; a branching section 24b formed on the light output side of the input-side linear section 24a; a separation section 24c disposed in a curve-shape or a linear-shape in such a way that the two branched cores 25a, 25b extending from the light output side of the branching section 24b separate from each other; and an output-side linear section 24d so that the branched cores 25a, 25b are parallel to each other.

Please amend the specification at page 11, lines 5-10 to read as follows:

Light inputting from an input port 26a on the input side reaches the branching section 24b through the input-side linear section 24a, and is input from the apex 27a into the light input section 27 and is output from the base perimeter 27b and is input into the branched cores 25a, 25b (light output section 28) through the cladding layer 3 to propagate. The light is output through the appropriate output ports 26b, 26c. Therefore, in this case also, propagation of light takes place as illustrated in Figures 1-3.

In the Claims:

1. (Amended) An optical switch comprising a cladding layer and a core disposed in an interior of the cladding layer for light propagating in such a way that a width of the core is enlarged at a branching section formed at a portion along a length of the core to provide plural branched cores to enable to alter a propagation path of inputted light by selective heating of portions of the branching section and the plural branched cores, wherein

a branching section heater for heating the branching section and branched core heaters for heating the plural branched cores are controlled separately, each branched core heater having distances from the branched core and a portion of the branching section facing the branched core so as not to disturb a light-branching operation.

5. (Amended) An optical switch according to claim 1, wherein

a minimum distance separating a branching core heater for heating one branched core of the plural branched cores and a center of a core adjacent to said one branched core is 40 μm or more; and

a minimum distance between the branching core heater and the branching section is 40 μm or more.